REMARKS

In this Amendment, Applicant has cancelled Claims 2, 4 – 8 and 10 – 15 without prejudice or disclaimer and amended Claims 1, 3 and 9 to overcome the rejections and further specify the embodiments of the present invention. It is respectfully submitted that no new matter has been introduced by the amended claims. All claims are now present for examination and favorable reconsideration is respectfully requested in view of the preceding amendments and the following comments.

REJECTIONS UNDER 35 U.S.C. § 112 SECOND PARAGRAPH:

Claims 2 – 8 and 10 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is respectfully submitted that the rejections have been overcome by this amendment. Claims 2, 4 – 8 and 10 have been cancelled without prejudice or disclaimer. Thus the rejection is moot. The amended Claims 1, 3 and 9 do not include terms that lack antecedent basis.

Therefore, the rejection under 35 U.S.C. § 112, second paragraph, has been overcome. Accordingly, withdrawal of the rejections under 35 U.S.C. § 112, second paragraph, is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 102:

Claims 1 – 9 have been rejected under 35 U.S.C. § 102 (b) as allegedly being anticipated by Yates (US Patent No. 3,650,783), hereinafter Yates. Claims 1 – 3 and 5 – 15 have been rejected under 35 U.S.C. § 102 (b) as allegedly being anticipated by Tomic (US Patent No. 4,174,227), hereinafter Tomic.

Applicant traverses the rejection and respectfully submits that the presently claimed invention is not anticipated by the cited reference. Claims 2, 4 – 8 and 10 have been cancelled without prejudice or disclaimer. Thus the rejection is moot. The amended Claims 1, 3 and 9 include the features of the present invention that are not disclosed or suggested by prior art, including Yates and Tomic.

To assist the Examiner in understanding the present invention, certain features are explained as follows. Investment casing uses binders called "sols" consisting of tiny silica acid particles dispersed in an alkaline medium. These sols are mixed with finely divided minerals to make slurries which are then deposited by dipping or brushing onto a wax or foamed plastic pattern or mould. The methods are called lost wax and lost foam, respectively. The wax patterns are removed prior to casting. The foam patterns remain in place until the molten metal is poured into them.

These sols and slurries are especially susceptible to or destabilized by lowering pH and/or the presence of trivalent anions in the mineral used to make the slurries. This has greatly restricted the number of minerals that can be chosen to make such slurries. For example, olivine--a common refractory and relatively cheap mineral, is not suitable to make the slurry.

Applicant has found that certain agents, such as trisodium phosphate and, to a lesser extent, sodium hypophosphite, sodium EDTA and sodium sulphite, stabilize slurries made with olivine and other ferruginous minerals, such as norite, and prevent premature gelation. In fact, the slurries made from olivine flour and silica sol stabilized with trisodium phosphate are more stable than their conventional counterparts made with silica sol and zircon flour. The invention does not require regular addition of caustic soda to maintain their pH in the desired range (9.5-11). The reason may be that the trisodium phosphate reacts with trivalent ions on the surface of the mineral, which would otherwise have acted as centers for destabilization of the sol, in such a way that they are converted to moieties whose solubility or activity is too low to destabilize the slurry. Such reason is a conjecture because of the fact that neither olivine nor norite contains trivalent cations that are sufficiently soluble to act in this way. Divalent cations do not appear to have the

same destabilizing effect. However, Applicant believes that divalent iron compounds, for example, $iron^{II}$ silicate that are present in many minerals are oxidized by oxygen dissolved in the sol to an $iron^{III}$ compound, probably the hydroxide, and that it is for this reason that conventional slurries made with minerals are unstable.

The advantage of the present invention is that it enables a far wider range of minerals to be employed for investing casting, which greatly reduces the cost of manufacture. Furthermore, the minerals most commonly employed to make conventional slurries are hazardous to health because they are radioactive (zircon) or contain silica dust (calcined china clay). The minerals of the present invention are innocuous.

Neither Yates nor Tomic discloses the features of the present invention as claimed. For example, the slurries in Yates and Tomic are not stable as the present invention, do not require a pH of between 9.5—11 or contain the mineral or water soluble salt as claimed. On page 4 of the Office Action, in applying the reference of Tomic, the Examiner erroneously cited Yates. Proper correction is respectfully requested.

It is further submitted that Tomic is irrelevant to the present invention as claimed. Tomic describes the use of phosphoric acid or an acidic phosphorous compound (phosphate) and not a tribasic phosphate, which would not function as the present invention, to make a grouting system and not a stable slurry. Although the system in Tomic does pass through a slurry-like stage, it is self-hardening like concrete. In fact the rapidity of hardening is emphasized. On the other hand, the embodiments of the present invention are not self-hardening but retain their fluidity for days and even weeks.

In US Patent No. 4,655,276 issued to Bird et al., the use of ferruginous minerals in colloidal silica based slurries is described to make shells for investment casting that are receptive to microwave heating. However, according to the examples of Bird et al., they carried out all their work by using graphite and not ferruginous minerals (for example, ferrosoferric oxide, Fe_3O_4), because similar slurries made with the latter will destabilize by forming gel in a matter of minutes and cannot be used to make investment casting shells unless the additive recommended in the present invention is used. Similarly,

olivine flour is also stated to be suitable as a mineral component in a colloidal silica slurry. However, this slurry destabilizes (i.e. flocculates or forms gel) in a matter of hours unless the additives of the present invention are added. Thus, Bird et al. failed to disclose nor suggest the present invention as claimed.

A further practical objection to Bird et al. and the use of ferrosoferric oxide (Fe_3O_4), manganese dioxide (MnO_2) and cobalt oxide in colloidal silica slurries is that they react with the silica at steel casting temperature with the formation of low melting point silicates that cause the shell to collapse during casting. The present invention as claimed does not have such problems.

Therefore, the newly presented claims are not anticipated by prior art including Yates and Tomic and the rejection under 35 U.S.C. § 102 (b) has been overcome. Accordingly, withdrawal of the rejection under 35 U.S.C. § 102 (b) is respectfully requested.

Having overcome all outstanding grounds of rejection, the application is now in condition for allowance, and prompt action toward that end is respectfully solicited.

Respectfully submitted,

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